Beta-Globin Gene Correction of Sickle Cell Disease in Hematopoietic Stem Cells

Grant Award Details

Beta-Globin Gene Correction of Sickle Cell Disease in Hematopoietic Stem Cells

Grant Type: Early Translational IV

Grant Number: TR4-06823

Project Objective: The main objective of the project is to develop stem cell gene therapy for Sickle Cell disease. Project will investigate the clinical-scale feasibility of targeted correction of sickle mutation in the beta-globin gene in autologous hematopoietic stem cells.

Investigator:

Name:	Donald Kohn
Institution:	University of California, Los Angeles
Type:	PI

Disease Focus: Blood Disorders, Pediatrics

Human Stem Cell Use: Adult Stem Cell

Cell Line Generation: Adult Stem Cell

Award Value: $1,652,076

Status: Closed

Progress Reports

Reporting Period: Year 1

View Report

Reporting Period: Year 2

View Report

Reporting Period: NCE (Y4)

View Report

Grant Application Details

Application Title: Beta-Globin Gene Correction of Sickle Cell Disease in Hematopoietic Stem Cells

Public Abstract: Disorders affecting the blood, including Sickle Cell Disease (SCD), are the most common genetic disorders in the world. SCD causes significant suffering and early death, despite major improvements in medical management and advances in understanding the complex disease-related biology. A bone marrow transplant (BMT) can greatly benefit patients with SCD, by providing a life-long source of normal red blood cells. However, BMT is limited by the availability of suitable donors and immune complications, especially for the more than 80% of patients who lack a matched sibling donor. An alternative treatment approach for SCD is to isolate some of the patient's own bone marrow and then use gene therapy methods to correct the sickle gene defect in the blood stem cells before transplanting them back into the patient. The gene-corrected stem cells could make normal blood cells for the life of the patient, essentially eliminating the SCD. Such an approach would avoid the complications typically associated with transplants from non-matched donors. We will define the optimal techniques to correct the sickle gene mutation in the bone marrow stem cells to develop as a therapy for patients with SCD.

Statement of Benefit to California: Development of methods for regenerative medicine using stem cells will have widespread applications to improve the health and to provide novel, effective therapies for millions of Californians and tens of millions of people worldwide. Many severe medical conditions can be cured or improved by transplantation of blood-forming hematopoietic stem cells (HSC), including genetic diseases of blood cells, such as sickle cell disease and inborn errors of metabolism, cancer and leukemia, and HIV/AIDS. Precise genetic engineering of stem cells to repair inherited mutation may be the best way to correct genetic defects affecting the mature cells they produce. This project will advance methods to precisely repair the genetic defect that underlies sickle cell disease in hematopoietic stem cells, which can then be transplanted to ameliorate the disease. These advances will have direct and immediate applications to enhance current medical therapies of sickle cell disease and will more broadly help to advance the capacities for regenerative medicine. All scientific findings and biomedical materials produced from our studies will be publicly available to non-profit and academic organizations in California, and any intellectual property developed by this Project will be developed under the guidelines of CIRM to benefit the people of the State of California.